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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,155	10/31/2003	Hideo Wada	Q78279	1659

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SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER
MALEVIC, DJURA

ART UNIT	PAPER NUMBER
2884	

DATE MAILED: 06/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

8/1

Office Action Summary	Application No.	Applicant(s)	
	10/697,155	WADA ET AL.	
	Examiner	Art Unit	
	Djura Malevic	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *6-8* is/are allowed.

6)☒ Claim(s) *1-5 and 9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Response to Amendment

The amendment was entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 – 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oda (US Patent 6,448,557 B2) in view of Cole et al (US Patent 6,046,485).

Regarding claim 1, Oda discloses a thermal infrared detector having a thermal isolation structure (Fig. 13), which comprises:

a) A substrate 1 having reflecting film 2 formed on a surface.

b) A thin-film infrared detecting portion 7, which is separated from the substrate 1 by a cavity 4 and the said thin-film 7 also creates heat according to the detected infrared rays.

c) A beam 6a separated by a gap from the infrared detecting portion, supporting the infrared detecting portion.

d) An electrode portion 13 and a metal wiring 9.

Oda also discloses the thermal infrared detector further comprising:

e) A shield 12, which extends from the infrared detecting portion separated by a gap from the beam and said shield also having an infrared absorbing thin film 14 together with the infrared detection portion.

Oda does not expressly disclose the beam being greater in thickness than the infrared detection portion in a direction perpendicular to the surface of the substrate. Cole teaches an infrared detector having beams wherein each beam comprises wiring 48 and protective layer 64, such that said beam has a thickness greater than the detecting portion 58 in a direction perpendicular to the surface of that substrate. Oda and Cole are analogous art because they are from the same field of endeavor, infrared detectors.

It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Oda to include a beam larger then the infrared detection portion as taught by Cole in order to reduce the time constant by reducing the thermal mass, which can then support faster speed arrays. This modification accomplishes speed without sacrificing other optimized characteristics, as this will not affect the resistive elements (beams) (Col. 2, Line 62 – Col. 3, Line 14).

Regarding claim 2, Oda discloses that the infrared detector has a thin film absorbing part 14 formed on the infrared incident surface 5. Oda also discloses the shield having an infrared absorbing film 14 formed on the infrared incident surface 5 and an opposite surface 12.

Regarding claim 3, Oda discloses the infrared detector wherein each of the infrared detecting portion 5 and the shield 12 is covered with a dielectric protective film 14 made of an infrared absorbing material.

Regarding claim 4, Oda discloses a thermal infrared detector having a thermal isolation structure (Fig. 13), wherein the thermal infrared detector comprises, in each pixel area:

a) A substrate having a contact pad (Abstract).

b) An infrared detecting portion 5, comprising: a heat detecting material thin film 7; an electrode portion 13, electrically connected to the said material 7; a dielectric protective film 8, surrounding the electrode portion 13 and said material 7; and an infrared absorbing film 14, separated by a space 4 from the substrate and arranged above the substrate 1.

c) A beam 6a supporting the infrared detecting portion 5 above the substrate 1.

Also, the beam comprises wiring 9 made of conductive material and electrically connecting the electrode of the infrared detector to the contact pad of the substrate. Furthermore, the said conductive material 9 being surrounded by a dielectric protective film 10.

d) A shield 12, extending outward from the infrared detecting portion 5, covering the beam 6a and contact pad. Additionally, said shield is above the substrate with a space from the surface of the beam and contact pad. Also, the

said shield having an infrared absorbing film 14 formed on the infrared surface 5 and opposite surface 12.

However, Oda does not expressly disclose the said protective film 10, greater in thickness than the dielectric protective film 8 in a direction perpendicular to the substrate. Cole teaches an infrared a detector having beams wherein each beam comprises wiring 48 and protective layer 64, such that said beam has a dielectric protective film 64 that has a thickness greater than the dielectric protective film of the infrared detecting portion 58 in a direction perpendicular to the surface of that substrate. Oda and Cole are analogous art because they are from the same field of endeavor, infrared detectors.

It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Oda to include a beam including the protective film larger then the infrared detection portion as taught by Cole in order to reduce the time constant by reducing the thermal mass, which can then support faster speed arrays. This modification accomplishes speed without sacrificing other optimized characteristics, as this will not affect the resistive elements (beams) (Col. 2, Line 62 – Col. 3, Line 14).

Regarding claim 5, Oda discloses a thermal infrared detector having a thermal isolation structure (Fig. 13), whereas the thermal infrared detector comprises:

a) A substrate having a contact pad (Abstract).

b) An infrared detecting portion 5, comprising: a heat detecting material thin film 7; an electrode portion 13, electrically connected to the said material 7; a

dielectric protective film 8, made of infrared absorbing material (Col. 11, Line 20) and surrounding the electrode portion 13 and said material 7; and an infrared absorbing film 14, separated by a space 4 from the substrate and arranged above the substrate 1.

c) A beam 6a supporting the infrared detecting portion 5 above the substrate 1.

Also, the beam comprises wiring 9 made of conductive material and electrically connecting the electrode of the infrared detector to the contact pad of the substrate 1. Furthermore, the said conductive material 9 being surrounded by a dielectric protective film 10.

d) A shield 12 made of an infrared absorbing material (Col. 12, Line 8) and extending outward from the infrared detecting portion 5 covering the beam 6a and contact pad. Additionally, the said shield is above the substrate 1 with a space from the surface of the beam and contact pad. Also, the said shield having an infrared absorbing film 14, formed on the infrared surface 5 and opposite surface 12.

However, Oda does not expressly disclose the said protective film 10, greater in thickness than the dielectric protective film 8 in a direction perpendicular to the substrate. Cole teaches an infrared detector having beams wherein each beam comprises wiring 48 and protective layer 64, such that said beam has a thickness greater than the detecting portion 58 in a direction perpendicular to the surface of that

substrate. Oda and Cole are analogous art because they are from the same field of endeavor, infrared detectors.

It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Oda to include a beam including the protective film larger then the infrared detection portion as taught by Cole in order to reduce the time constant by reducing the thermal mass, which can then support faster speed arrays. This modification accomplishes speed without sacrificing other optimized characteristics, as this will not affect the resistive elements (beams) (Col. 2, Line 62 – Col. 3, Line 14).

Regarding claim 9, Oda discloses the claimed invention (fig. 13) and a method comprising the steps of:

a) Preparing the substrate 1 having a contact pad 11 (Col. 11, Line 32).

b) Infrared reflecting film 2 is formed on the surface of the substrate 1 (Col. 10, Line 49).

c) The infrared reflecting film 2 being covered by dielectric protective film 3 (Col. 10, Line 54).

d) A polyimide film is packed as a sacrificial layer into cavity 4 (Col. 11, Line 55), which is on the surface of the substrate (Col. 15, Line 12), said sacrificial layer is covered by dielectric protective film (Col. 15, Line 29).

e) Heat detecting material thin-film 7 is next formed on the surface of the dielectric protective film (Col. 15, Line 33).

f) Forming a third dielectric protective film is next formed over the entire surfaces of exposed part of the second dielectric film except part of the heat detecting material thin-film (Col. 16, Line 41).

g) Forming openings in each of the first, second and third dielectric protective films at the contact pad and in the heat detecting material thin-film at a slit corresponding to the electrode (Col. 15, Line 50 – Col 16 Line 67).

h) Forming a metal film throughout an entire surface of the third dielectric film and an entire inner wall of each of the openings (Col. 16, Line 18 – Col. 16, Line 67).

i) Patterning the metal film so that the third dielectric protective film is exposed to form the electrode of the infrared detector and the metal wiring of the beam (Col. 16, Line 33 – Col. 16, Line 46).

j) Forming a fourth-dielectric protective film on a surface or each of the metal wiring and the third dielectric film (Col. 16, Line 41).

k) Outlining the three dielectric protective films so that the first sacrificial layer forms a slit as a gap between the infrared detector and the beam and boundary slit as a boundary between adjacent pixels (Col 16, Line 55 – Col 16, Line 67).

l) Next, fourth-dielectric protective film 41 is etched into slit forms to partially expose second sacrificial layer 40, shield 12 is thus formed from dielectric protective film 41 that remains from the second sacrificial layer, which extends from the outer perimeter of the infrared detecting portion separated by a

gap from the beam so as to cover the beam on an infrared incident side with a space interposed between the beam and the shield (fig 12K) (Col. 17, Line 38).

m) Forming on the surface of the forth dielectric protective film 37, a second sacrificial layer 40 for forming the first slit and the boundary slit with each slit having an exposed surface with first sacrificial layer 31 at the bottom 38 with a space between the beam 6 and the shield 12, therefore covering the beam 6 on an infrared incident side and a space between the contact pad 11 of the substrate 1 and the shield 12 (Col. 17, Line 1 –Col. 17, Line 31).

n) Removing the first and second sacrificial layers through the first, second and boundary slits (Col. 17, Line 51).

However, Oda does not expressly disclose etching the fourth dielectric film on the infrared detecting portion, so that the thickness of the fourth dielectric protective film is reduced to form the fifth dielectric protective film. Cole teaches an infrared detector having the infrared detection portion etched to reduce the cross sectional mass so that the thickness of protective film is reduced to form a reduced dielectric protective film. Oda and Cole are analogous art because they are from the same field of endeavor, infrared detectors.

It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Oda to include in the method a step for etching the fourth dielectric protective film, therefore reducing the size of fourth dielectric film to form a fifth dielectric protective film as taught by Cole in order reduce the cross-section of pixels, created by well-known thin film techniques, such as masking and etching. This

reduction will have a positive effect on the pixel's operational characteristics. More specifically, the reduction in mass directly affects the time constant of the pixels, which is proportionally related to the pixel speed capabilities. Consequently, a reduction in time constant translates into a higher speed pixel (Col. 4, Line 7 - Col. 4, Line 29). (Note layer 36 constitutes an etch stopper that would be etched according to the new fifth dielectric protective film.

Allowable Subject Matter

Claims 6 - 8 are allowed.

The following is an examiner's statement of reasons for allowance:

With regards to claim 6, the prior art on record does not teach or render obvious a method of producing a thermal infrared detector comprising a step of forming an etch stopper metal thin film on the fifth dielectric protective film of the infrared detecting portion except on an area to become an end portion of a shield wherein the shield is separated by a gap from the beam on an infrared incident side and later etching and soon after removing the etch stopper metal thin film to expose the fifth dielectric protective film, in combination with the rest of the claim limitations.

Claims 7 and 8 are allowable base on their dependencies.

Response to Arguments

Applicant's arguments filed 03/30/2006 have been fully considered but they are not persuasive with regards to claims 1- 5 and 9.

The examiner has further clarified the rejections with regards to claims 1, 5 and 9. However, since the scope of the rejection has not changed according to claims 1-5 and 9, this action is ***Final***.

With regards to claim 1 - 5, the applicant suggest that Cole fails to teach the beam being greater in thickness than the infrared detecting portion and the conductive material being surrounded by a dielectric protective film greater in thickness than the dielectric protective film of the infrared detecting portion.

The examiner disagrees. Cole clearly discloses in figure 4 a beam comprising wire 48 and dielectric layer 64, larger in thickness than the infrared detecting portion 58. The examiner also notes that figure 4 clearly discloses the conductive wire 4 surrounded by a dielectric layer 64 larger in size than the dielectric protective layer 64 of the infrared detecting portion 58.

With regards to claims 9, applicant attention is guided to the above response with regards to beams thickness and protective layers thickness. Applicants' attention is also guided to Cole and the *Summary of The Invention*. Cole clearly teaches that by reducing thermal mass (removing some protective layer), the time constant is also reduced. This allows for faster pixel operation, which can then support faster speed arrays leading to higher efficiency.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Gooch et al. (US Patent 6,690,014) teaches a micro bolometer and method for forming.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Djura Malevic whose telephone number is 571.272.5975. The examiner can normally be reached on Monday - Friday between 8:30am and 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Djura Malevic
Patent Examiner
Art Unit 2884
571.272.5975

OTILIA GABOR
PRIMARY EXAMINER